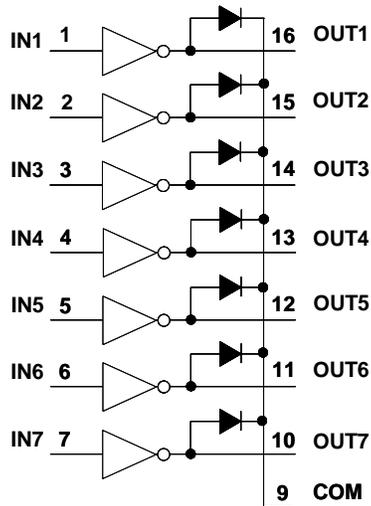
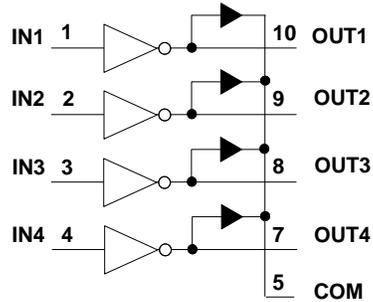


Functional Diagram



ULN2003V12

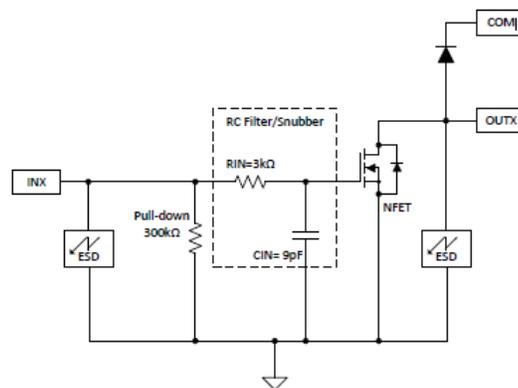


ULN2003F12

Pin Descriptions

Pin Name	Pin Number			Description
	SO16	TSSOP16	DFN3030-10	
IN1 ~ IN7	1~7	1~7	1~4	Logic Input Pins IN1 through IN7
GND	8	8	5	Ground Reference Pin
COM	9	9	6	Internal Free-Wheeling Diode Common Cathode Pin
OUT7 ~ OUT1	10~16	10~16	7~10	Channel Output Pins OUT7 through OUT1

Functional Block Diagram (Single Channel)



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating		Unit
		MIN	MAX	
V _{IN}	Pin2 IN1~IN7 to GND Voltage	-0.3	5.5	V
V _{OUT}	Pins OUT1~OUT7 to GND Voltage	—	20	V
V _{COM}	Pin COM to GND Voltage	—	20	V
I _{GND}	Max GND-Pin Continuous Current (+100°C <T _J < +125°C)	—	700	mA
	Max GND-Pin Continuous Current (T _J < +100°C)	—	1.0	A
P _D	Total Device Power Dissipation at T _A = +85°C	16 Pin – SOIC	TBD	W
		16 Pin – TSSOP	TBD	W
		10 Pin – DFN3030	TBD	W
θ _{JA}	Thermal Resistance Junction-to-Ambient (Note 6)	16 Pin – SOIC	TBD	°C/W
		16 Pin – TSSOP	TBD	
		10 Pin – DFN3030	TBD	
θ _{JC}	Thermal Resistance Junction-to-Case (Note 7)	16 Pin – SOIC	TBD	°C/W
		16 Pin – TSSOP	TBD	
		10 Pin – DFN3030	TBD	
ESD	HBM	—	4	kV
	CDM	—	1	kV
T _J	Junction Temperature	-55	150	°C
T _{STG}	Storage Temperature	-55	150	°C

- Notes:
- Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
 - All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.
 - Maximum power dissipation is a function of T_{J(max)}, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} – T_A)/θ_{JA}. Operating at the absolute maximum T_J of +150°C can affect reliability.
 - Maximum power dissipation is a function of T_{J(max)}, θ_{JC}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} – T_C)/θ_{JC}. Operating at the absolute maximum T_J of +150°C can affect reliability.

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	TYP	Max	Unit
V _{OUT}	Channel Off-Stage Output Pull-Up Voltage	—	—	16	V
V _{COM}	COM Pin Voltage	—	—	16	V
I _{OUT(ON)}	Per Channel Continuous Sink Current	V _{INx} = 3.3V	—	100 ⁽⁵⁾	mA
		V _{INx} = 5.0V	—	140 ⁽⁵⁾	
T _J	Operating Junction Temperature	-40	—	125	°C

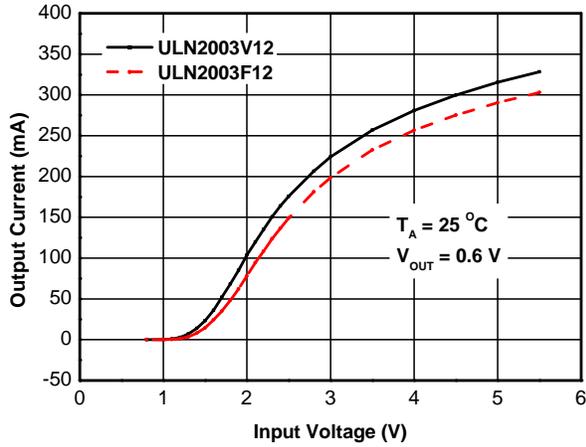
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

 Specified over the recommended junction temperature range T_J = -40°C to +125°C and over recommended operating conditions unless otherwise noted. Typical values are at T_J = +25°C.

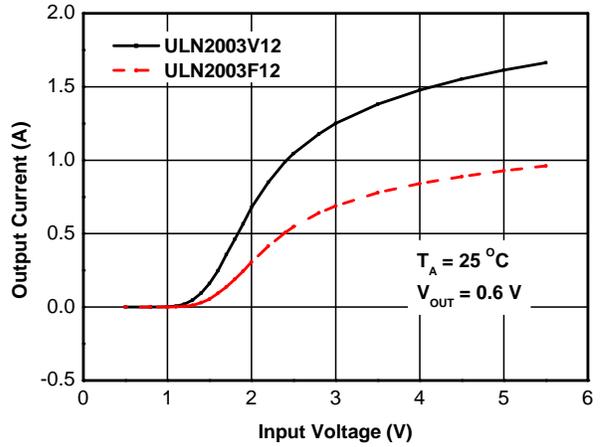
Parameter	Test conditions	Min	Typ.	Max	Unit	
INPUTS IN1 THROUGH IN7 PARAMETERS						
V _{I(ON)}	IN1~IN7 logic high input voltage	V _{CE} = 2V, I _C = 300mA	1.65	—	—	V
V _{I(OFF)}	IN1~IN7 logic low input voltage	I _I = 250μA, I _C = 100mA	—	—	0.6	V
I _{I(ON)}	IN1~IN7 ON state input current	I _F = 350mA	—	12	25	uA
I _{I(OFF)}	IN1~IN7 OFF state input leakage		—	—	250	nA
OUTPUTS OUT1 THROUGH OUT7 PARAMETERS						
V _{OL(VCE-SAT)}	OUT1~OUT7 low-level output voltage	V _{INX} = 3.3V, I _{OUTX} = 20mA	—	0.12	0.15	V
		V _{INX} = 3.3V, I _{OUTX} = 100mA	—	0.6	0.75	
		V _{INX} = 5.0V, I _{OUTX} = 20mA	—	0.09	0.11	
		V _{INX} = 5.0V, I _{OUTX} = 140mA	—	0.6	0.75	
I _{OUT(ON)}	OUT1~OUT7 ON-state continuous current at V _{OUTX} = 0.6V	V _{INX} = 3.3V, V _{OUTX} = 0.6V	80	100	—	mA
		V _{INX} = 5.0V, V _{OUTX} = 0.6V	95	140	—	
I _{OUT(OFF)}	OUT1~OUT7 OFF-state leakage current	V _{INX} = 0V, V _{OUTX} = V _{COM} = 16V	—	0.5	—	uA
SWITCHING PARAMETERS						
t _{PHL}	OUT1~OUT7 logic high propagation delay	V _{INX} = 3.3V, V _{pull-up} = 12V, R _{pull-up} = 1kΩ	—	50	70	ns
t _{PLH}	OUT1~OUT7 logic low propagation delay	V _{INX} = 3.3V, V _{pull-up} = 12V, R _{pull-up} = 1kΩ	—	121	140	ns
t _{CHANNEL}	Channel to channel delay	Over recommended operating conditions and with same test conditions on channels.	—	15	50	ns
R _{PD}	IN1~IN7 input pull-down resistance	—	210k	300k	390k	Ω
ζ	IN1~IN7 input filter time constant	—	—	9	—	ns
C _{OUT}	OUT1~OUT7 output capacitance	V _{INX} = 3.3V, V _{OUTX} = 0.4V	—	15	—	pF
FREE-WHEELING DIODE PARAMETERS						
V _F	Forward voltage drop	I _{F-peak} = 140mA, V _F = V _{OUTX} - V _{COM}	—	1.2	—	V
I _{F-peak}	Diode peak forward current	—	—	140	—	mA

Performance Characteristics

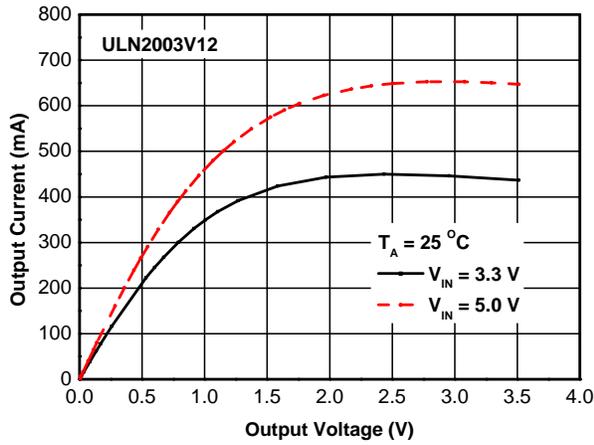
Output Current vs. Input Voltage (One Darlington)



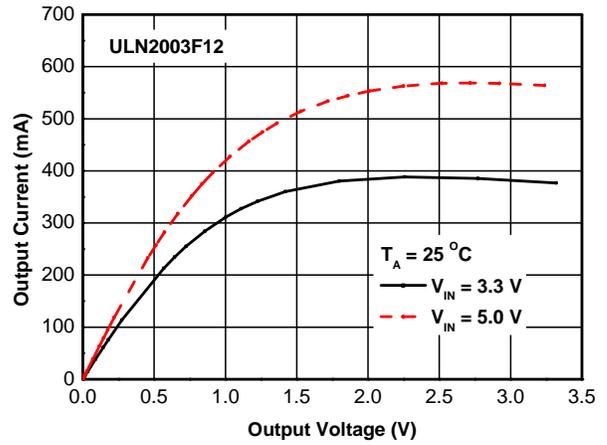
Output Current vs. Input Voltage (All Darlings in Parallel)



Output Current vs. Output Voltage

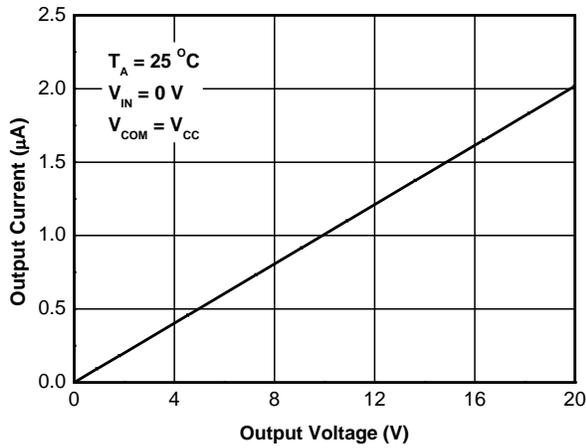


Output Current vs. Output Voltage

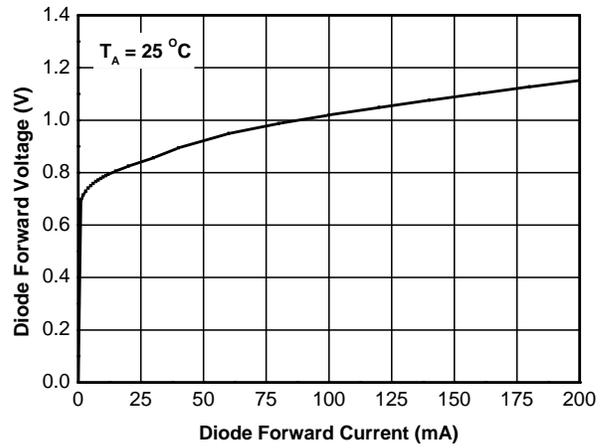


Performance Characteristics (Cont.)

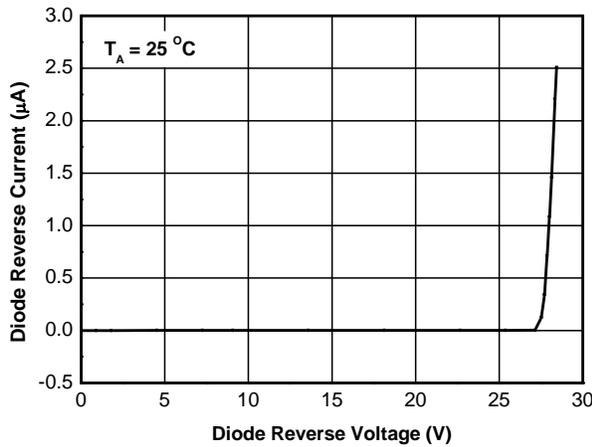
Output Current vs. Output Voltage



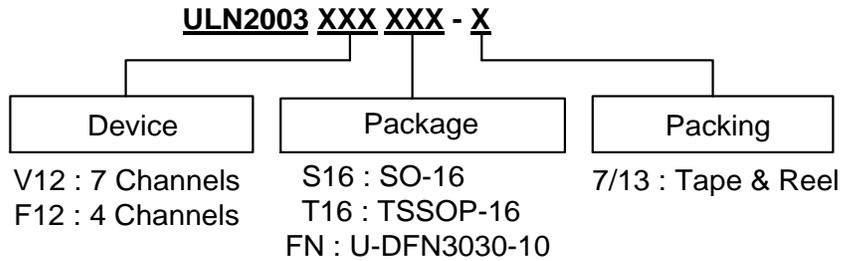
Diode Forward Voltage vs. Diode Forward Current



Diode Reverse Current vs. Diode Reverse Voltage



Ordering Information

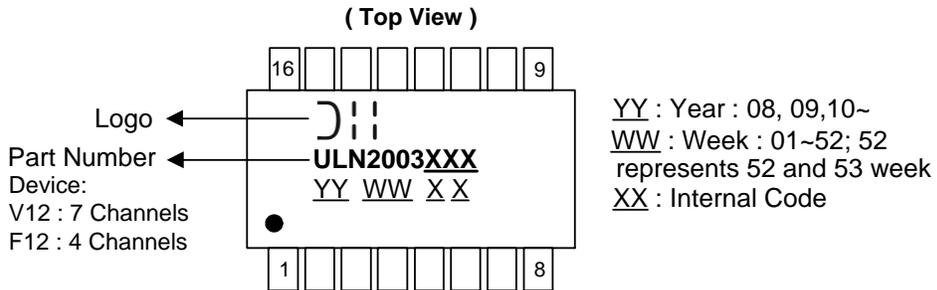


Device	Package Code	Packaging (Note 11)	7"/13" Tape and Reel	
			Quantity	Part Number Suffix
ULN2003V12S16-13	S16	SO-16	2,500/Tape & Reel	-13
ULN2003V12T16-13	T16	TSSOP-16	2,500/Tape & Reel	-13
ULN2003F12FN-7	FN	DFN3030-10	3,000/Tape & Reel	-7

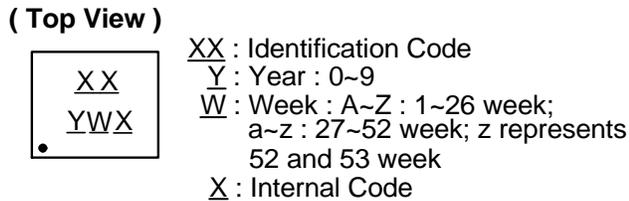
Note: 8. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Marking Information

(1) SO-16 and TSSOP-16



(2) DFN3030-10



Part Number	Package	Identification Code
ULN2003F12FN-7	DFN3030-10	A3

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